Manuscript Report No. 90-14

Moose Population Estimates for Game Hunting Area 8: 1988/89

By Cross, Dale W. 1990

Manitoba
Natural Resources
Wildlife Branch

NOT FOR PUBLICATION

This manuscript report is for your information only, with the understanding that its contents are not for general distribution or publication. Many of the reports in this series are in the nature of progress reports which will eventually be assembled into final reports for publication, or will be subject to additional analysis. The information herein is the property of the Wildlife Branch. The authors reserve priority for publication. Citations should be by permission only, and should be referred to as personal communications.

Prepared by:

Dale W. Cross
Resource Technician

Approved by:

Gene Collins
Regional Wildlife Manager

91-00363/

MS REPORT NO. 90 - 14

Moose Population Estimates for Game Hunting Area 8: 1988/89

Cross, Dale W. 1990

Manitoba Natural Resources
Wildlife Branch

Cross, Dale W. 1990

Moose Population Estimates for Game Hunting Area 8: 1988/89

Department of Natural Resources, Wildlife Branch

MS Report No. 90 - 14, ..., p.p.

ABSTRACT

A moose (*Alces alces*) population survey was flown in Game Hunting Area 8, east of The Pas in January 1989 to provide a current moose population estimate. Approximately 17% of the 3,152 sq km area was surveyed resulting in a population point estimate of 996 moose. A 95% confidence interval indicates a population estimate between 800 and 1,192 moose. The population has increased by 142% since the last survey flown in January 1986 and reverses a population decline that had been occurring during the 1970's and early 1980's. The population recovery can be largely attributed to the cessation of hunting as a result of the establishment of a co-operative Moose Management Program in 1985.

Submitted: April 1990

Distributed:

TABLE OF CONTENTS

	Page
ABSTRACT	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iii
LIST OF FIGURES	iii
ACKNOWLEDGEMENTS	1
INTRODUCTION	2
METHODS	4
RESULTS	4
DISCUSSION	8
RECOMMENDATIONS	10
LITERATURE CITED	11

LIST OF TABLES

Table		Page
1	Strata characteristics used to stratify G.H.A. 8 ..	6
2	Number of quadrats sampled and mean number of moose per quadrat	6
3	Comparison of moose densities in the four stratum 1976 - 1989	9
4	Moose calves per 100 adult females and twinning rate in Game Hunting Area 8, 1984/85 to 1988/89	9

LIST OF FIGURES

Figure		Page
1	Game Hunting Area 8 and surrounding area	3
2	Boundaries and locations of the four strata used in aerial moose surveys in G.H.A. 8	5
3	1976 - 1989 moose population estimates for G.H.A. 8	7

ACKNOWLEDGEMENTS

Thanks are extended to Gordon Dengate, Natural Resource Officer of The Pas Detachment for assisting on the survey as recorder and observer, to Mr. John Constant and Mr. Irvin Constant, members of The Pas Indian Band, and Mr. Bert Lagimodiere of The Pas Fish and Wildlife Forever, for contributing as recorders, to Mr. Mark Hoff of Beaver Air Service for providing excellent service throughout the survey, and to Mr. Gene Collins for acting as an observer and reviewing the manuscript.

INTRODUCTION

Game Hunting Area 8 (G.H.A. 8), east of The Pas, Manitoba (Fig. 1) is 3,152 square kilometres of prime moose habitat and consists of a network of river and creek channels and levees, shallow lakes and marshes. Further area descriptions can be found in U.S. Bureau of Sport Fisheries and Wildlife (1961).

A decline in the moose population was documented in aerial surveys conducted in 1976, 1977, 1981 and 1986 (Cross et al, 1986). The decrease is largely attributed to an over harvest of moose through licensed and native hunting. These surveys indicated that the moose population declined from approximately 1,000 in 1976 to approximately 400 in 1986.

In 1985, in response to the moose herd decline, The Province of Manitoba, entered into a co-operative Moose Management Agreement with The Pas Area Wildlife Association, Indian Bands of Moose Lake, The Pas and Easterville, and Community Councils of Cormorant and Moose Lake. An Agreement was signed by all parties, which resulted in a prohibition, albeit voluntary on behalf of native people, on moose hunting from December 1, 1985 to December 1, 1989.

Since the results of the January 1986 aerial survey indicated a continuing decline in the population, it was deemed essential to repeat the survey in January 1989. This report represents the results of that survey.

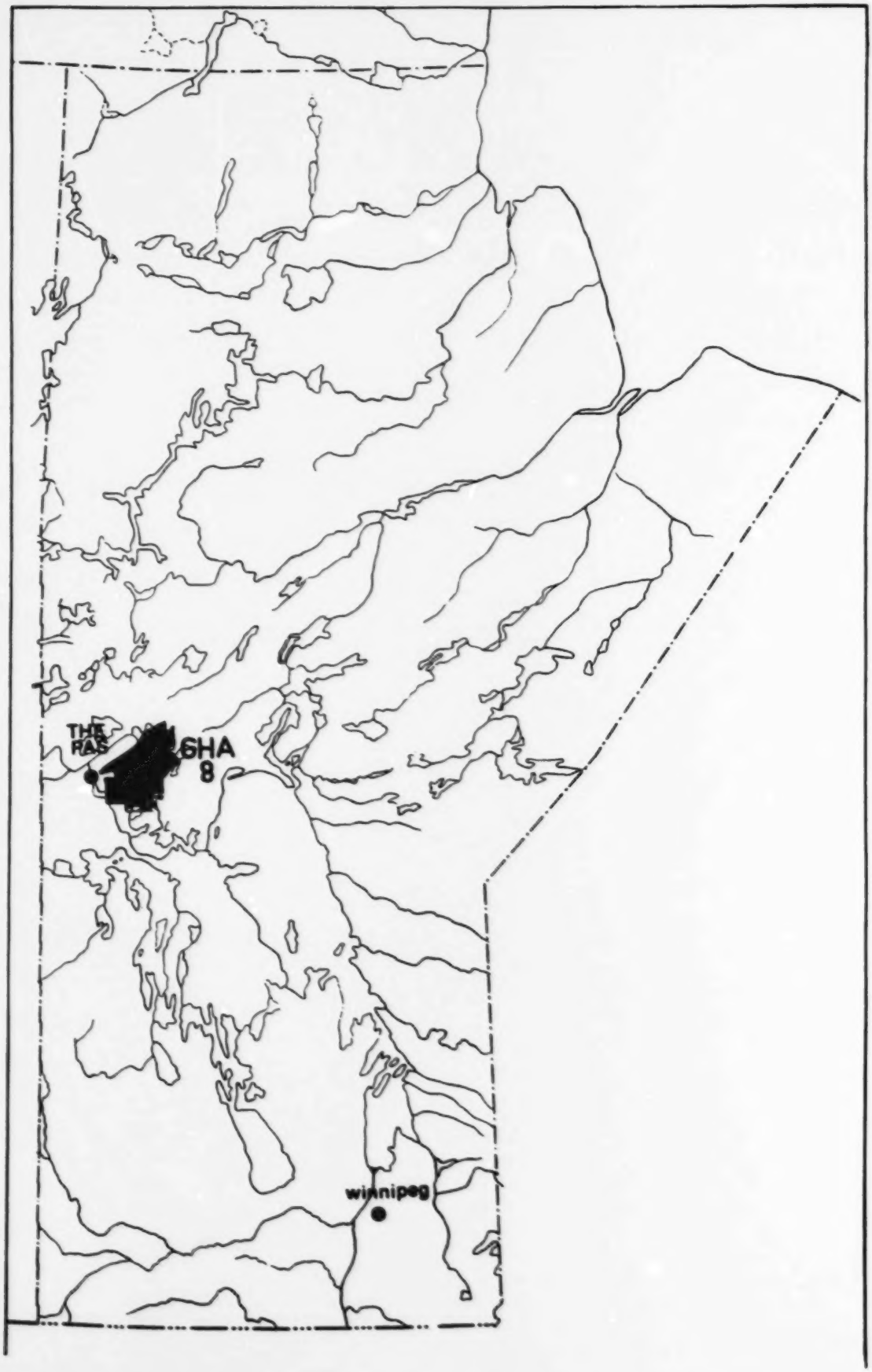

Fig. 1. Game Hunting Area 8 and surrounding area

METHODS

Survey methods applied in the 1989 survey followed those described in Cross et al (1983) and have been followed in G.H.A. 8 surveys flown in 1976, 1977, 1981, 1983, 1986. The boundaries and locations of the four strata have not changed from previous surveys (Fig. 2). Sampling effort and the approximate abundance of moose (used to allocate sampling effort) in the four strata are found in Table 1. Flights were conducted between 16 and 25 January, 1989.

Data were analyzed with the same program (Jacobson and Weatherill, 1975) and computer (HP 9830) used in previous years. The program followed Snedecor and Cochrane (1967).

RESULTS

Approximately 17% of the area of G.H.A. 8 was surveyed with sampling intensities of 22%, 21%, 17% and 12% respectively within the four strata. Analysis of the 1989 data (Table 2) shows a moose population point estimate of 996, with a 95% confidence interval from 800 to 1,192. These results indicate a 142% increase in the population since the last survey flown in 1986 and reverses a 15 year population decline (Fig. 3).

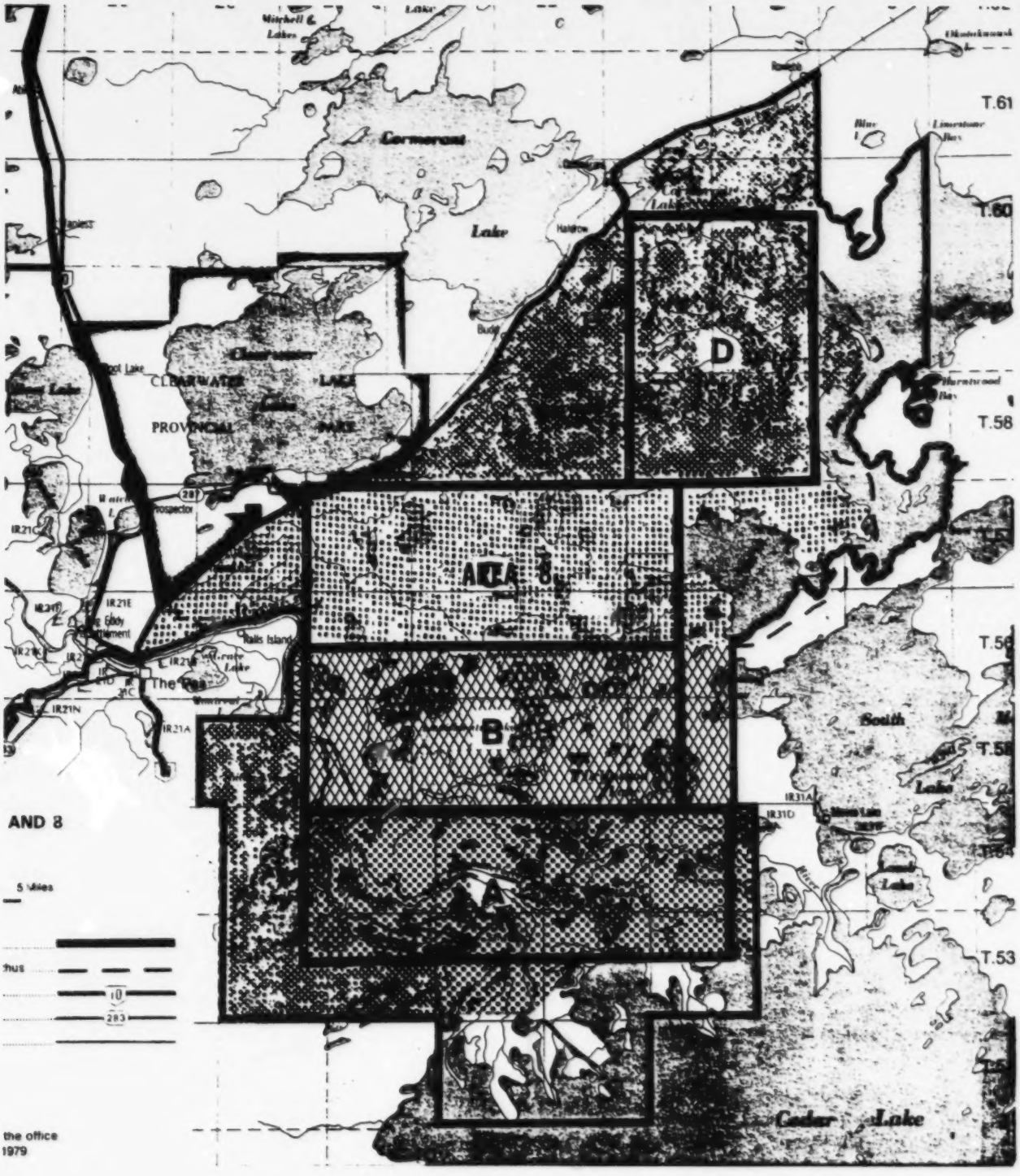

Fig. 2. Boundaries and locations of the 4 strata used in 1976, 1977, 1981, 1986, 1989 moose population estimates for G.H.A. 8.

Survey Blocks representing each stratum;

BLOCK A (Stratum 1) BLOCK B (Stratum 2)

BLOCK C (Stratum 3) BLOCK D (Stratum 4)

Table 1. Strata characteristics used to stratify G.H.A. 8

Stratum Number	Sample Block	Quadrat Size (Sq Km)	Total Quadrats	Mean No.* Moose/Quadrat	Standard* Deviation
1	A	2.91	220	0.62	0.92
2	B	2.91	198	0.52	1.29
3	C	2.91	242	0.34	0.82
4	D	4.86	252	0.36	0.68

*1986 G.H.A. 8 population survey. Cross et al. (1986)

Table 2. Number of quadrats sampled and mean number of moose per quadrat.

Stratum Number	Number of Quadrats	Sample Quadrats	Quadrat Size (Sq Km)	Mean Moose Per Quadrat	Standrad Deviation
1	220	48	2.91	1.83	1.81
2	198	41	2.91	0.66	0.99
3	242	42	2.91	0.69	0.98
4	252	29	4.86	1.17	1.65
Totals	912	160			

Mean number of moose/sq km	=	0.3167
Mean number of moose/quadrat	=	1.092
Estimate total population	=	996
95% confidence interval	=	+/- 196.02

MOOSE POPULATION ESTIMATES
GHA - 8

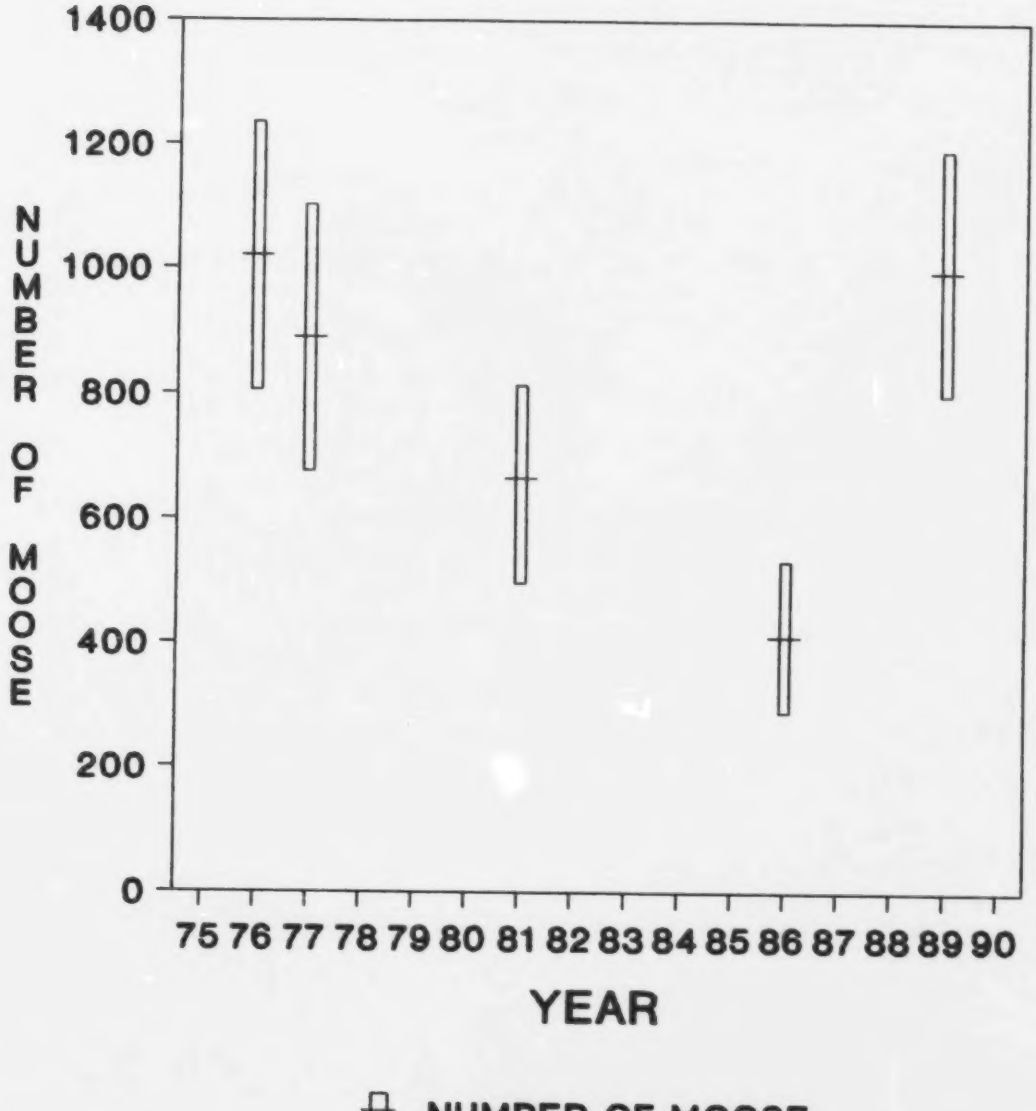

Fig. 3. 1975 - 1989 moose population estimates for Game Hunting Area 8. Point estimates are shown as solid squares. Confidence intervals (95%) are shown as vertical bars.

DISCUSSION

The remarkable increase in the G.H.A. 8 moose population appears to have occurred in most strata, with the greatest increase occurring in Stratum 1 and 4 where the density has tripled since 1986, from .21 to .63 and .07 to .24 moose per sq km respectively (Table 3).

Consideration should be given to dividing Survey Block D into two strata to better differentiate population projections between coniferous and marsh habitats. The increase in moose density in the area appears to be occurring primarily in the marsh habitat.

A decline in the native moose harvest as a result of the Co-operative Moose Management Agreement has resulted in a population growth throughout the entire area. However, this may only partially explain the large increases in Survey Blocks A and D. Absence of predation may also be contributing to the increase. Existing wolf information (1989 personal communication, Bob Uchtmann) suggests an absence of wolves in Survey Block D, which may account for increasing moose numbers. However, the same wolf data points out the continuing presence of wolves in Block A where the moose population tripled in three years. It is possible that, because of higher densities, moose numbers in Block A were capable of increasing despite wolf predation and some native harvest.

The population increase cannot be explained by increasing calf survivorship as moose age and sex surveys (Cross, D. 1989) indicated that recruitment, based on calf survival to six months (Table 4) has not changed significantly over the past five years.

Table 3. Comparison of Game Hunting Area 8 moose densities (moose/sq km) in the four stratum, 1976 - 1989.

Stratum	1976	1977	1981	1986	1989
1	.74	.51	.39	.21	.63
2	.30	.34	.16	.18	.23
3	.36	.24	.23	.12	.24
4	.10	.16	.13	.07	.24
Mean Density:	0.324	0.283	0.208	0.131	0.317

Table 4. Moose calves per 100 adult females and twinning rate in Game Hunting Area 8, 1984/85 to 1988/89.

Year	Calves per 100 Females	Twinning Rate
1984/85	59	29
1985/86	41	15
1986/87	63	23
1987/88	73	21
1988/89	59	23
Five Year Mean	59	22

Results of this survey suggest that the G.H.A. 8 moose population has increased at least twofold over three years. The lower confidence interval of 800 moose should be used as a population estimate when developing sound management plans and harvest strategies for the area. The absence of an increase in moose encounters for each hour of survey time during age and sex surveys also suggests that a conservative estimate should be considered (Cross, D. 1990).

RECOMMENDATIONS

1. Portions of G.H.A. 8 should be re-stratified before the next population survey.

2. G.H.A. 8 should be surveyed again in 1991-1992 to determine the status of the population. Moose population surveys must also be planned every three years to provide population estimates as a basis for harvest allocation and management decisions.

3. Annual wolf population and moose harvest monitoring programs should continue in order to provide supporting data for continued co-operative management of moose in G.H.A. 8.

LITERATURE CITED

Cross, Dale. 1990. 1988/89 Moose age and sex survey G.H.A. 8; Department of Natural Resources, Wildlife Branch. MS Report No. 90 - 13. -- pp.

Cross, Dale, Gene Collins and Brian Knudsen. 1986. Moose population estimates for Game Hunting Area 8: 1986. Department of Natural Resources, Wildlife Branch. MS Report No. 86-11. 11 pp.

Cross, D., B. Knudsen and B. Jahn. 1983. Moose population estimates for Game Hunting Area 8: 1976, 1977 and 1981. Department of Natural Resources, Wildlife Branch. MS Report No. 83-24. 15 pp.

Jacobson, J. and R. Weatherill. 1975. Application of quadrat and strip plot sampling techniques to an aerial census of white-tailed deer in Manitoba Interlake. Man. Department of Mines, Resources and Environment Management, Winnipeg. 51 pp.

Knudsen, B. 1984. Status of the moose herd in the Saskatchewan River Delta region, 1952 - 1961. Department of Natural Resources, Wildlife Branch. MS Report No. 84-8. 30 pp.

Snedecor, G.W. and W.G. Cochrane. 1967. Statistical methods 6th ed. Iowa State University Press, Ames. 593 pp.

U.S. Bureau of Sport Fisheries and Wildlife. 1961. Grand Rapids hydro-electric project. Saskatchewan River, Manitoba. A report of fish and wildlife resources. 108 pp.